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March 9, 1837.

The Rev. ADAM SEDGWICK, M.A., V.P., in the Chair.

A paper was read, entitled, "Researches on the Tides. Seventh Series. On the Diurnal Inequality of the Height of the Tide, especially at Plymouth and at Singapore : and on the Mean Level of the Sea." By the Rev. W. Whewell, A.M., F.R.S., Fellow of Trinity College, Cambridge.

The diurnal inequality which the author investigates in the present paper, is that by which the height of the morning tide differs from that of the evening of the same day ; a difference which is often very considerable, and of great importance in practical navigation, naval officers having frequently found that the preservation or destruction of a ship depended on a correct knowledge of the amount of this variation. In the first section of the paper he treats of the diurnal inequality in the height of the tides at Plymouth, at which port good tide observations are regularly made at the Dock Yard ; and these observations clearly indicate the existence of this inequality. As all the other inequalities of the tides have been found to follow the laws of the equilibrium theory, the author has endeavoured to trace the laws of the diurnal inequality by assuming a similar kind of correspondence with the same theory ; and the results have confirmed, in the most striking manner, the correctness of that assumption. By taking the moon's declination four days anterior to the day of observation, the results of computation accorded, with great accuracy, with the observed heights of the tides : that is, the period employed was the fifth lunar transit preceding each tide.

In the second section, the observations made on the tides at Singapore from August 1834 to August 1835, are discussed. A diurnal inequality was found to exist at that place, nearly agreeing in law and in amount with that at Plymouth ; the only difference being that, instead of four days, it was found necessary to take the lunar declination a day and a half preceding the tide ; or, more exactly, at the interpolated, or north lunar transit, which intervened between the second and third south transit preceding the tide. The diurnal inequality at Singapore is of enormous magnitude, amounting in many cases to six feet of difference between the morning and evening tides ; the whole rise of the mean tide being only seven feet at spring tides, and the difference between mean spring and neap tides not exceeding two feet.

In the third section, the author considers the diurnal inequalities at some other places, and the general law of its progress. The change which the *epoch*, (that is, the anterior period at which the moon's declination corresponds to the amount and direction of the inequality,) in particular, undergoes, is a subject of great interest. At Liverpool, the epoch is found to be about six days and a quarter ; at Bristol, it is nearly six days ; and at Leith, it is as much as twelve days. On the east coast of America, it appears to be *zero*. On the coasts of

Spain, Portugal, and France, it is successively two, and three days ; and on those of Cornwall and Devonshire, four days ; thus observing a tolerably regular augmentation as it is traced along the line of coast from the shores of the Atlantic to the Firth of Forth, but travelling more slowly than the other inequalities.

In section fourth, the author treats of certain extreme cases of diurnal inequality ; particularly those which produce the phenomenon of a single tide in the twenty-four hours : such as that noticed by Capt. Fitzroy at King George's Sound, on the south coast of New Holland ; and that of Tonquin, referred by Newton to the interference of two tides arriving by different channels, but probably owing to the operation of the same law as that which gives rise to the diurnal inequality.

In section fifth, the author considers the subject of the mean height of the sea ; that is, the height midway between low water and high water each day : and arrives at the result that it is very nearly constant.

March 16, 1837.

The Right Honourable the EARL OF BURLINGTON, V.P.,
in the Chair.

John Burnet, Esq., was elected a Fellow of the Society ; and Charles Julius Roberts, M.D., was balloted for, but not elected.

A paper was read, entitled, " On the Tides." By John William Lubbock, Esq., F.R.S., &c. &c.

Since the author presented his last paper on the tides to the Society, his attention has been directed to ascertain the three following points : namely, 1st, Whether, from the discussion of the Liverpool observations with reference to a previous transit, these observations present the same kind of agreement with Bernouilli's theory as those of London : 2ndly, Whether, by taking into account a greater number of observations, the results given in his last paper remain sensibly unaltered : and 3rdly, Whether the *establishment* of the Port of London varies sensibly in different years ; and whether the removal of the old London bridge has occasioned any difference. In order to elucidate these points, he procured the assistance of Mr. Jones and Mr. Russell to compute numerous tables ; employing for that purpose a further sum of money placed at his disposal with this view by the British Association for the Advancement of Science. The results contained in the tables here presented, are all laid down in diagrams, on the same plan as those contained in his last paper, by which means they are much more readily understood. The author finds that the semi-menstrual correction for the interval at Liverpool presents the same agreement with observation as had been before noticed ; while the form or law of the semi-menstrual correction for the height is also the same as that indicated by the observations ; but in order to render the agreement complete it would be necessary to change the epoch, or to make a slight movement of the theory-curve in the diagrams. This